



Stabilizing latent fingermarks developed with iodine fuming: A new method

Varinder Singh^a, P. Mandal^b, Stojkovicj Sasho^c, Metodija Najdoski^d, Oklevski Slobodan^e, O.P. Jasuja^{f,*}

^a Assistant Professor of Chemistry, RIMT University, Punjab, India

^b Assistant Professor of Forensic Science, RIMT University, Punjab, India

^c Assistant Professor of Chemistry, MIT Univerisity, Skopji Republic of North Macedonia

^d Full Professor of Chemistry, Institute of Chemistry, Faculty of Natural Sciences and Mathematics, Ss. Cyril and Methodius University - Skopje, Arhimedova 5, 1000, Skopje, Republic of North Macedonia

^e Police Advisor for Police & Criminalistics Matters, Ministry of Interior, Republic of North Macedonia

^f Professor of Forensic Science, RIMT University, Punjab, India

ARTICLE INFO

Keywords:

Forensic science
Latent fingermark
Iodine fuming
Tetra-*n*-butylammonium iodide (TBAI)
Phase transfer catalyst (PTC)
Spectroscopic methods

ABSTRACT

Efficient visualization of latent fingermarks is vital in forensic science considering variables like surface type, deposition time, and treatment method. Iodine fuming, a simple, non-destructive method, faces challenges with rapid fading of developed marks causing hindrance in documenting the developed marks. The present research introduces a novel iodine fuming procedure enhanced by a simple pre-treatment with tetra-*n*-butylammonium iodide (TBAI), a white powdery material, ensuring prolonged fixation of visualized marks. The method, effective across surfaces, both porous as well as non-porous stabilizes iodine fumed fingermarks via formation of tetra-*n*-butylammonium triiodide (TBATI), as confirmed through spectroscopic analyses with UV-Visible, Fourier-transformed infrared and Raman spectroscopy. Aged fingermarks up to 4 weeks developed on different surfaces responded positively to the method. The suggested method is non-destructive and simple to use.

1. Introduction

The development of latent fingermarks is a cornerstone of forensic science, providing crucial evidence in criminal investigations. The iodine fuming method is one of the simplest methods which find application for visualization of latent fingermarks on various surfaces [1]. Iodine fuming is one of the oldest known techniques for the development of latent fingermarks. First mention of use of iodine fumes to visualize latent fingermarks by Paul-Jean Coulier [2]. The method is based on absorptions of iodine on the surface of latent fingermark's papillary lines because of lipids present in sebaceous material hence providing contrast with background of substrate. However, the contrast of the visualized fingermark rapidly fades away due to the iodine re-sublimation and therefore post-treatment with a fixation reagent is generally suggested. Not many methods are available in the literature to fix these marks. Benzoflavone reagent is used to fix the developed fingermarks developed with iodine fumes [3]. Many modifications of this

method were also suggested [4,5] but the process remained complicated one. Trowell (6) also mentioned the use of water and starch treatment of iodine developed prints to fix them but cautioned of not using too much spray of the water. Trowell (6) reported a new method to fix the latent fingermarks developed with iodine fumes with the use of *p,p'*-tetramethyldiaminodiphenylmethane (tetrabase). Adcock [7] reported the use of silver plate transfer of iodine prints from the surface and exposing them to light to make them permanent. A significant contribution explored the development of latent fingermarks on thermal paper, proposing a novel iodine fuming technique that resulted in the permanency and clarity of fingermarks without necessitating pre- or post-treatment [8]. Limitation of the finding was that it was effective only in case of thermal paper while other surfaces do not respond to this method. To overcome the issue of surface specificity, a study introduced a brucine-based reagent that successfully fixes latent fingermarks on both porous and non-porous surfaces without background coloration, which addresses the fading issues with iodine fuming [9]. Sharma et al.,

* Corresponding author.

E-mail addresses: sasostojkovicj@gmail.com (S. Sasho), metonajd@pmf.ukim.mk (M. Najdoski), slobodanoklevski79@gmail.com (O. Slobodan), opjasuja@gmail.com, opj@rimt.ac.in (O.P. Jasuja).

<https://doi.org/10.1016/j.jics.2025.101694>

Received 20 November 2024; Received in revised form 4 March 2025; Accepted 30 March 2025

Available online 31 March 2025

0019-4522/© 2025 Indian Chemical Society. Published by Elsevier B.V. All rights are reserved, including those for text and data mining, AI training, and similar technologies.